Examiners' Report
Lead Examiner Feedback

January 2022

Pearson BTEC Nationals
In Sport (31524H)
Unit 1: Anatomy and Physiology

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link:
http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Awarding BTEC qualifications in 2022

Ofqual has set out their plans for awarding qualifications in 2022 and intend to return to a normal, pre-pandemic, approach to grading standards over by 2023. They have confirmed that 2022 will be a transition year, to reflect that we are in a pandemic recovery period and students' education has been disrupted.

Our guiding principle and approach to awarding BTEC qualification results in 2022 will be to ensure parity in relation to the approach being taken for GCSE and A level learners. BTEC courses have a different structure and design to academic qualifications - BTECs are modular

qualifications (with assessments taking place throughout the course) compared to GCSEs and A levels which are linear (assessed and awarded at the same time at the end of the year), and therefore our approach needs to be different.

In 2022 we will return to the usual method of calculating BTEC qualification results, however adaptations including, U-TAGs and reduced internal assessment, are in place to provide a comprehensive package of support for students.

The basis of our awarding approach to BTECs this year is to ensure it is as fair as possible for all learners. We will use a range of evidence to set grade boundaries for the external units. Part of this evidence will be to closely monitor learner performance in all assessments that contribute to learners' final qualification grade, to ensure parity with A level and GCSEs.

Further information can be found on our website and via our Social Media channels.

Unit Code: Unit title

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	9	19	36	54

Introduction

Centres and candidates should be congratulated on their preparation for this assessment format, in some very challenging times. Overall, candidates performed slightly better than previous series and it was obvious that they prepared for many of the specification topics covered in this assessment, to which they need congratulating for.

The question paper followed the format identified in the sample assessment materials and previous series. The paper was split into six sections. Each section was based on a sport or exercise scenario and required candidates to demonstrate knowledge and understanding of a range of specification topics and apply this knowledge to the specific question scenario. Each section is weighted in accordance to the specification design.

The extended response questions were marked using a 'levels based' approach to assessment where the overall quality of the response was considered rather than the specific number of facts stated from the indicative content, although this obviously had a bearing on the quality of the response. The remainder of the questions on the paper were assessed using a traditional points-based approach, where a mark was given for each appropriate point. More detail can be found below in the individual question section of the report.

Introduction to the Overall Performance of the Unit

This report has been written to help you understand how candidates have performed overall in the exam. For each question there is a brief analysis of candidate responses. You will also find examples of candidate responses to the questions that have been well answered. These should help to provide additional guidance. We hope this will help you to prepare your candidates for future examination series.

Candidate performance varied throughout the paper. Whilst the extended response questions still provided the greatest challenge, most candidates gained some marks for these questions, and it is encouraging to see that more candidates are accessing to top mark boundaries. The style of the assessment is challenging due to the depth and breadth of knowledge required to fully address the demands of the paper. The extended writing questions account for just over 30% of the

paper, each question demanding depth of knowledge, but across the paper this also requires breadth as each of these questions examines different areas of the specification.

The assessment is also challenging due to the need to apply knowledge not only in the extended answer questions but also the 'points-based' questions.

It was clear that some candidates did not make full use of the stimulus material provided in the question, to reiterate, with explain command verb questions, there is an expectation that knowledge and understanding tested, is applied to the situation in context and expansion marks are awarded accordingly.
Nevertheless, performance continues to get better series by series, with the mean mark increasing by 1.5 and the highest paper total was 78/80.

As always, the emphasis in this paper is on candidate's application of their knowledge to a variety of practical sports related situations. The higher marks, particularly in levelled response questions (Sections C-F), will always focus on the ability to demonstrate application rather than the ability to recall theory. It will be important for candidates to have the opportunity to practice this in their preparation for the assessment. Candidates that were able to access higher marks for these questions were able to apply their knowledge and understanding to the stimulus and provide realistic and appropriate responses.

As this is a vocational sports related subject, the external assessment seeks to put the candidates in applied sporting related situations and asks them to respond to these: this method of questioning will continue in the future. It is therefore essential that centres stress to candidates the need to read the stimulus information carefully before they answer questions, and be prepared to use this information within their responses, this also applies when graphical or statistical data is supplied.

Where candidates are unable to apply the stimulus in their answer it will significantly restrict the number of marks candidates can receive. Generic responses will only gain limited credit.

Where the stimulus material uses a particular sport, it is not necessary for candidates to have an in-depth knowledge of this type of sport in order to answer the questions well, however, an awareness of the basic

requirements of sports are expected which will have been covered in core curriculum PE lessons throughout KS3 and KS4.

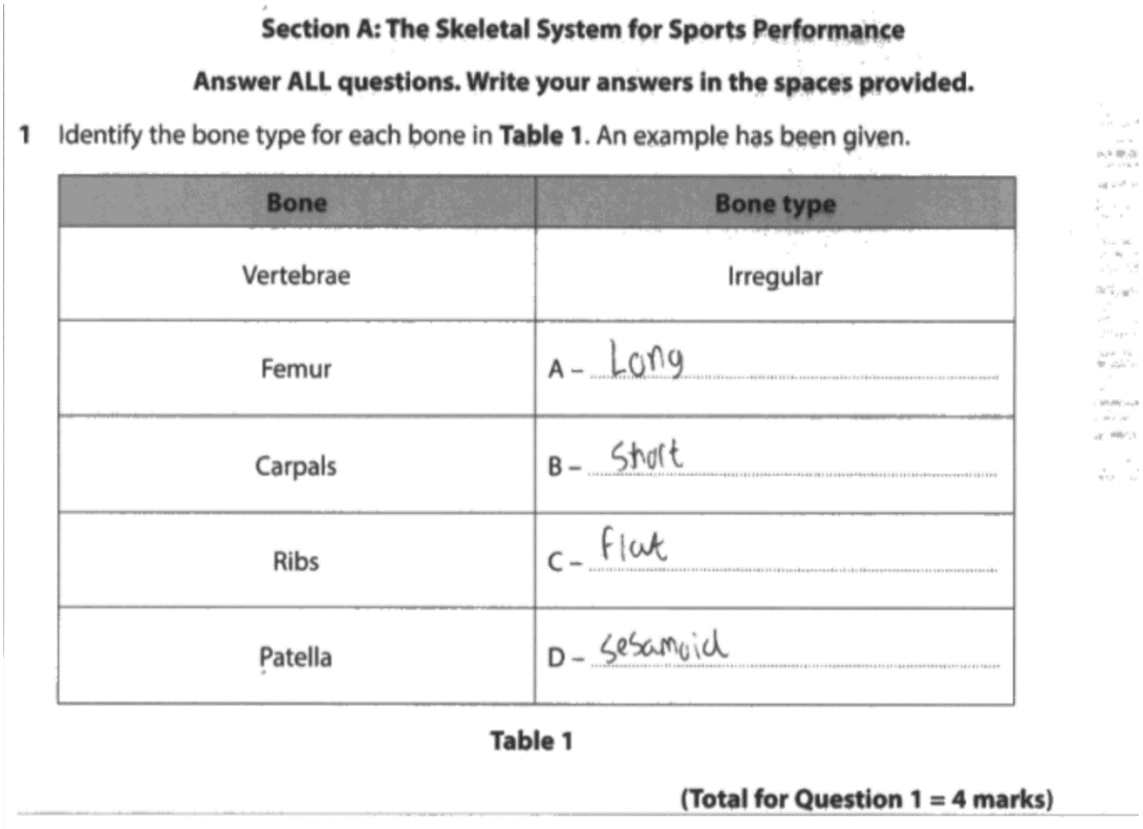
Individual Questions

The following section considers each question on the paper, providing examples of popular candidate responses. This section should be considered with the live external assessment and corresponding mark scheme.

Q1a

The majority of candidates performed as anticipated on this question, with many identifying the correct answers. It is important that technical terminology is used and phonetic spelling was credited. Common errors were labelling patella as irregular.

This response gained 4 marks



Section A: The Skeletal System for Sports Performance

Answer ALL questions. Write your answers in the spaces provided.

1 Identify the bone type for each bone in **Table 1**. An example has been given.

Bone	Bone type
Vertebrae	Irregular
Femur	A – Long
Carpals	B – Short
Ribs	C – Flat
Patella	D – Sesamoid

Table 1

(Total for Question 1 = 4 marks)

Q2a

Candidates were required to state the movement that occurs at a pivot joint. On the whole candidates found this question more challenging than anticipated. Common errors made were stating circumduction or flexion and extension as the movement.

This response gained 1 mark

2 (a) State the movement that occurs at a pivot joint.

(1)

Rotation

Joints are classified according to the degree of movement they allow.
One classification is a cartilaginous (slightly moveable) joint.

(b) Give **one** example of a cartilaginous (slightly moveable) joint.

(1)

W Vertebrae

Q2bi and Q2bii

Candidates were required to look at the two images and state the joint movement that was happening in the following sporting actions. Q2bi required candidates to respond with circumduction. Common errors made by the candidates was putting rotation as the response. Q2bii was answered much better, with the vast majority stating extension as the correct answer. Those who did not answer this correctly identified the type of joint (hinge) rather than the movement occurring as directed by the question.

This response gained 1 mark

(b) State the joint movements happening in the following sporting actions.

Figure 1

(i) The shoulder of a cricket player when bowling overarm, as shown in **Figure 1.**

(1)

Circumduction

This response gained 1 mark.

Source: © UfaBizPhoto/Shutterstock

Figure 2

(ii) The elbow of a gymnast when holding a handstand, as shown in **Figure 2.**

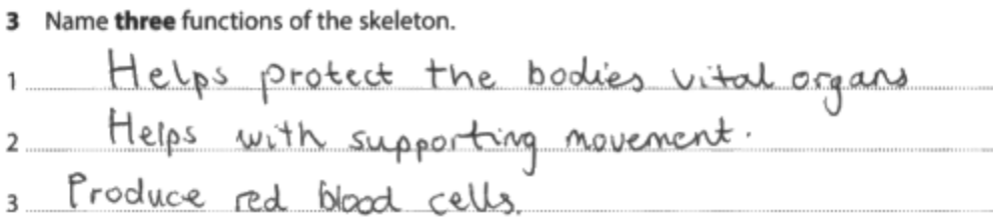
(1)

extension

Q3

Candidates answered this question well, with the majority scoring full marks for correctly identifying three functions of the skeleton. The minority who didn't access full marks was largely due to repetition; (e.g) the cranium protects the brain followed by the ribs protect the heart.

This response gained 1 mark.


3 Name **three** functions of the skeleton.

1 Helps protect the bodies vital organs

2 Helps with supporting movement.

3 Produce red blood cells.

Q4

The majority of candidates performed as anticipated on this question, with a nice spread of marks, many could identify the role of the articular cartilage (shock absorbing/reducing friction), but fewer could effectively expand on these points in the context of the question. To reiterate, with explain command verb questions, there is an expectation that knowledge and understanding tested, is applied to the situation in context and expansion marks are awarded accordingly.

This response gained 3 marks

Kamal is a long jumper.

4 Explain why the articular cartilage in the knee is important when performing a long jump.

- articular cartilage is the thick, strong cartallage on the end of a bone that protects the bone and stops the bones wearing / rubbing together
- by storing minerals making it dense, strong and able to bear alot of weight.
- when performing a long jump articular cartilage absorbs shock, stops bones from rubbing together and aids movement, so when Kamal bends his knees in order to jump and puts pressure on his knees when landing, the articular cartilage supports his weight, putting him at a lower risk of injury.

(Total for Question 4 = 3 marks)

TOTAL FOR SECTION A = 13 MARKS

This response gained 1 mark.

Kamal is a long jumper.

4 Explain why the articular cartilage in the knee is important when performing a long jump.

The articular cartilage around the knee is important because it prevents any friction of bones and it needs to allow joint movement to prevent this from happening.

Q5

Candidates performed as anticipated on this question, with the spread of marks clearly outlining their knowledge and understanding of antagonistic muscle actions (topic B3).
It is important that technical terminology is used and phonetic spelling was credited. Common errors were labelling all responses as either as the agonist or antagonist, which indicates the terms fixators and synergists are unknown to the candidates who provided these such responses.

This response gained 4 marks

Muscles work together to produce movement. Muscles have different roles within antagonistic muscle actions.

5 Identify which role is being described in **A–D** in **Table 2**.

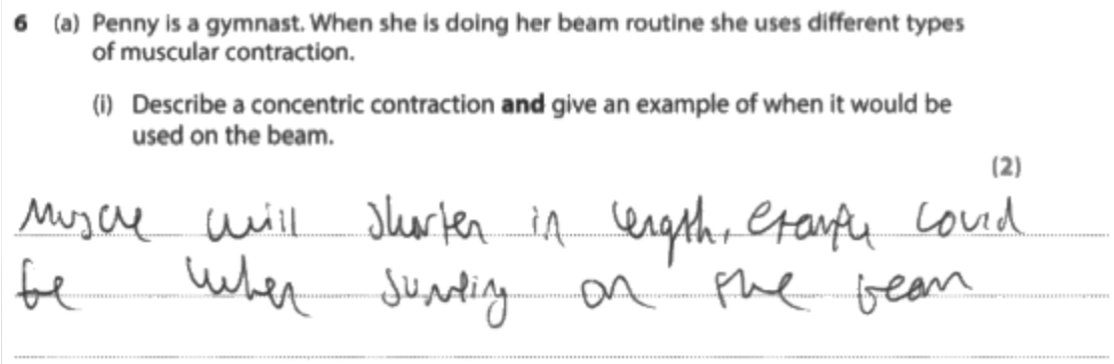
Description	Role of a muscle
A muscle that is responsible for the movement taking place, the 'prime mover'.	A – agonist
A muscle or group of muscles that work with the active muscle to generate movement.	B – Synergist
The muscle that relaxes to allow the movement to happen.	C – antagonist
The muscle that acts as a stabiliser to stop any unwanted movement of the joint.	D – fixator

Table 2

Q6ai, 6aii, 6aiii

These questions were recall questions, Q6ai and 6aii required candidates to describe the type of muscle contraction given and provide an example to where it used on the beam, correct examples on their own were awarded credit, if the description of the contraction was incorrect.
On the whole candidates performed well and identified correctly the characteristic of the type of contraction (concentric – shorten, isometric – no movement), errors seen when describing the contraction was to say it was the 'positive' contraction for 6ai.
Common errors for the expansion were giving a static hold (eg, handstand) as the example for 6ai and an example of movement taking place for 6aii. Other examples where learners didn't generate credit was from using examples not on the beam; (e.g) 6ai – the upward phase of a bicep curl. It is clear that the candidates who responded in this way had been taught that example but did not relate it to the question.
6aiii, required the description of an eccentric contraction (muscle lengthens) without the example, errors seen when describing the contraction was to say it was the 'negative' contraction.

This response gained 2 marks



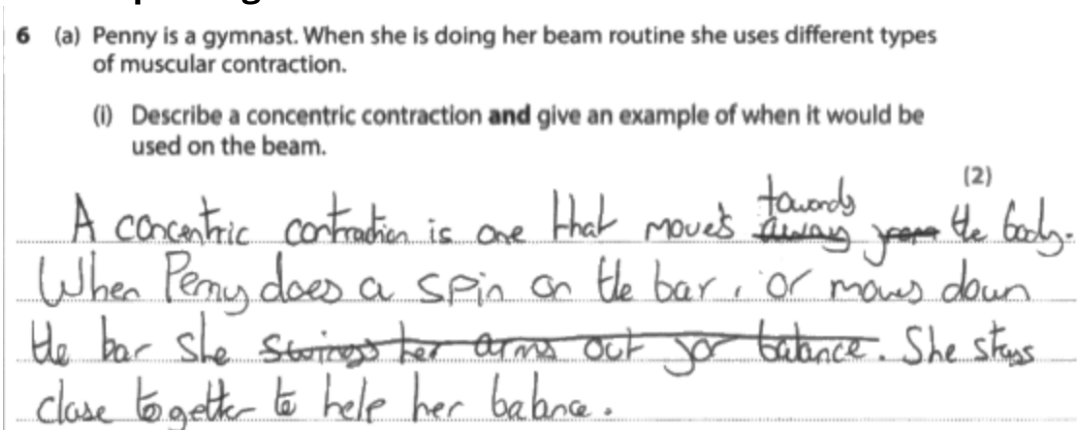
6 (a) Penny is a gymnast. When she is doing her beam routine she uses different types of muscular contraction.

(i) Describe a concentric contraction **and** give an example of when it would be used on the beam.

(2)

Muscle will shorten in length, example could be when sitting on the beam

This response gained 1 mark



6 (a) Penny is a gymnast. When she is doing her beam routine she uses different types of muscular contraction.

(i) Describe a concentric contraction **and** give an example of when it would be used on the beam.

(2)

A concentric contraction is one that moves towards ~~away from~~ the body. When Penny does a spin on the bar, or moves down the bar she ~~stretches her arms out for balance~~. She stays close together to help her balance.

This response gained 2 marks

(ii) Describe an isometric contraction **and** give an example of when it would be used on the beam.

(2)

An isometric contraction is when the working muscle contracts without changing in length. for Example the ~~bicep~~ tricep whilst holding a handstand

This response gained 1 mark

(ii) Describe an isometric contraction **and** give an example of when it would be used on the beam.

(2)

An isometric contraction is where muscles on both sides of the body are working at the same time e.g a handstand on the beam.

This response gained 1 mark

(iii) Describe an eccentric contraction.

This is when the muscle lengthens.

This response gained 0 marks

(iii) Describe an eccentric contraction.

(1)

Where the muscles are moving whilst working.

Q6b

The majority of candidates found this question challenging to access the full marks, a significant number correctly identified that type IIx fibres are fast twitch or have fast/powerful contractions.
Significantly fewer identified the expansion of this point; when sprinting in the run up/to generate height on the vault. Common errors were providing more information about the characteristic, which was irrelevant in the question; they fatigue quickly.

During the vault Penny will use mainly type IIx muscle fibres.

Source: © StockphotoVideo/Shutterstock

Figure 3

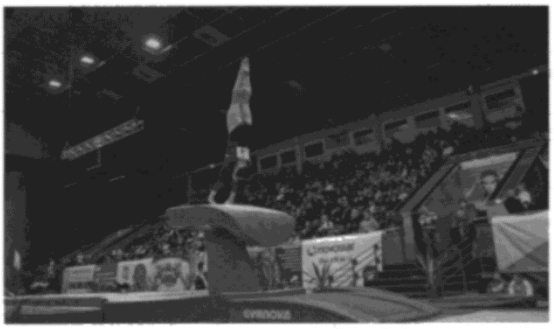
(b) Explain why type IIx muscle fibres are used during the vault.

(2)

Type IIx are fast twitch muscle fibres and are used for speed and power, they are used for the vault for when the athlete is ~~running~~ sprinting to the trampoline.

This response gained 1 mark

During the vault Penny will use mainly type IIx muscle fibres.



Source: © StockphotoVideo/Shutterstock

Figure 3

(b) Explain why type IIx muscle fibres are used during the vault. (2)

Because in Vault there is a Very fast short run up and at the end a powerful jump and after this you are tired very quickly

Q6c

The significant majority of candidates answered correctly; that an increased blood supply meant that more oxygen would go to the working muscle and linked this to a delayed onset of fatigue, and therefore scored two marks. Significantly fewer accessed the mark that comes in between these, that it enables Penny to create energy. Common errors were articulating that she could perform for a longer duration, but the floor routine is a time-based exercise and therefore, she wouldn't want to perform for longer.

Candidates who took the other stream that increased blood supply increases muscle temperature, linked that nicely into increased pliability and therefore greater range of movement/reduced risk of injury.

This response gained 3 marks

When Penny is doing her floor routine the blood supply to her muscles increases.

(c) Explain the impact of an increased blood supply on Penny's muscles.

(3)

This means she is able to get more oxygen to her working muscles to supply the mitochondria so they can aerobically respire and produce energy ~~over~~ more energy she may need to perform to a higher level. This can also mean more waste products in CO_2 are removed more efficently if you have a more frequent supply of haemoglobin in the blood

This response gained 1 mark

When Penny is doing her floor routine the blood supply to her muscles increases.

(c) Explain the impact of an increased blood supply on Penny's muscles.

(3)

because when pennys muscles are working they require more oxygen, ~~therefore~~ the muscles need more oxygen to keep ~~moving~~ working. A increased blood supply would help penny as her muscles will be able to perform for a longer duration. A increased blood supply is caused hypertension, this allow more blood ~~/~~oxygen to get to the working muscles.

(Total for Question 6 = 10 marks)

TOTAL FOR SECTION B = 14 MARKS

Q7

Candidates performed as anticipated on this question, with the spread of marks clearly outlining the candidate's knowledge and understanding of lung volumes.
It is important that technical terminology is used and phonetic spelling was credited. Common errors were labelling all responses as tidal volume, which indicates the lung volumes are unknown to the candidates who provided these such responses.

This response gained 4 marks

7 Complete **Table 3** by naming each lung volume described (**A–E**).

Description	Lung Volume
The air that remains in the lungs after maximal expiration.	A – Residual volume
The maximum amount of air that can be forced out of the lungs after maximum inhalation.	B – Vital capacity
The volume of air passing in or out of the lungs in 60 seconds.	C – [illegible]
The volume of air in the lungs after maximal inhalation.	D – Total lung volume
The amount of air breathed in or out during a normal breath.	E – Tidal volume

Table 3

Q8

Surprisingly, candidates found this question difficult, and this was reflected in their scoring. Two marks were awarded for identification of the respiratory adaptations (topic C6) and two marks for the linked expansion. Expansion marks were not awarded without the correct adaptation identified and thus affected their scoring.
Common errors made were bringing in respiratory responses (topic C5) and therefore those candidates scored 0 marks.

This response gained 3 marks

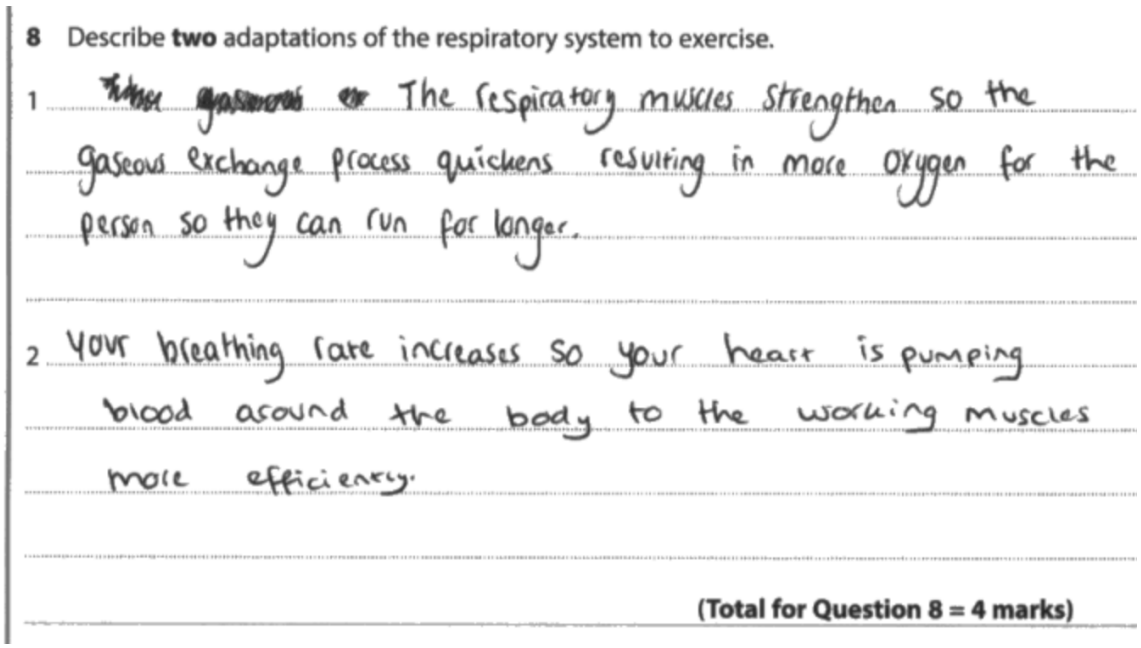
8 Describe **two** adaptations of the respiratory system to exercise.

1 Vital capacity increases. This means the amount of air you can inhale in and out in one breath increases. This means that less breaths are needed to meet the demand of the body when exercising

2 Respiratory muscles get stronger. This means that the intercostal muscles can pull the ribs out further allowing more air in the thoracic cavity.

(Total for Question 8 = 4 marks)

This response gained 2 marks



8 Describe **two** adaptations of the respiratory system to exercise.

1 The respiratory muscles strengthen so the gaseous exchange process quickens resulting in more oxygen for the person so they can run for longer.

2 your breathing rate increases so your heart is pumping blood around the body to the working muscles more efficienty.

(Total for Question 8 = 4 marks)

Q9

This was the first extended response question of the paper and focused on the changes that occur to the mechanism of breathing from rest to exercise and the impact this has on performance. Responses for the question required focus on the changes in contractions of respiratory muscles, volume of thoracic cavity, pressure inside the thoracic cavity and air flow. The candidates needed to articulate that this happens with 'greater force', expand further etc. The indicative content was written accordingly to encompass this knowledge and application.

Like all of the extended response questions, the quality of candidates' responses varied. Some candidates were clearly very knowledgeable about the change in the mechanisms. Other candidates were unable to address the question fully and only highlighted the mechanisms at rest and not the changes as required.

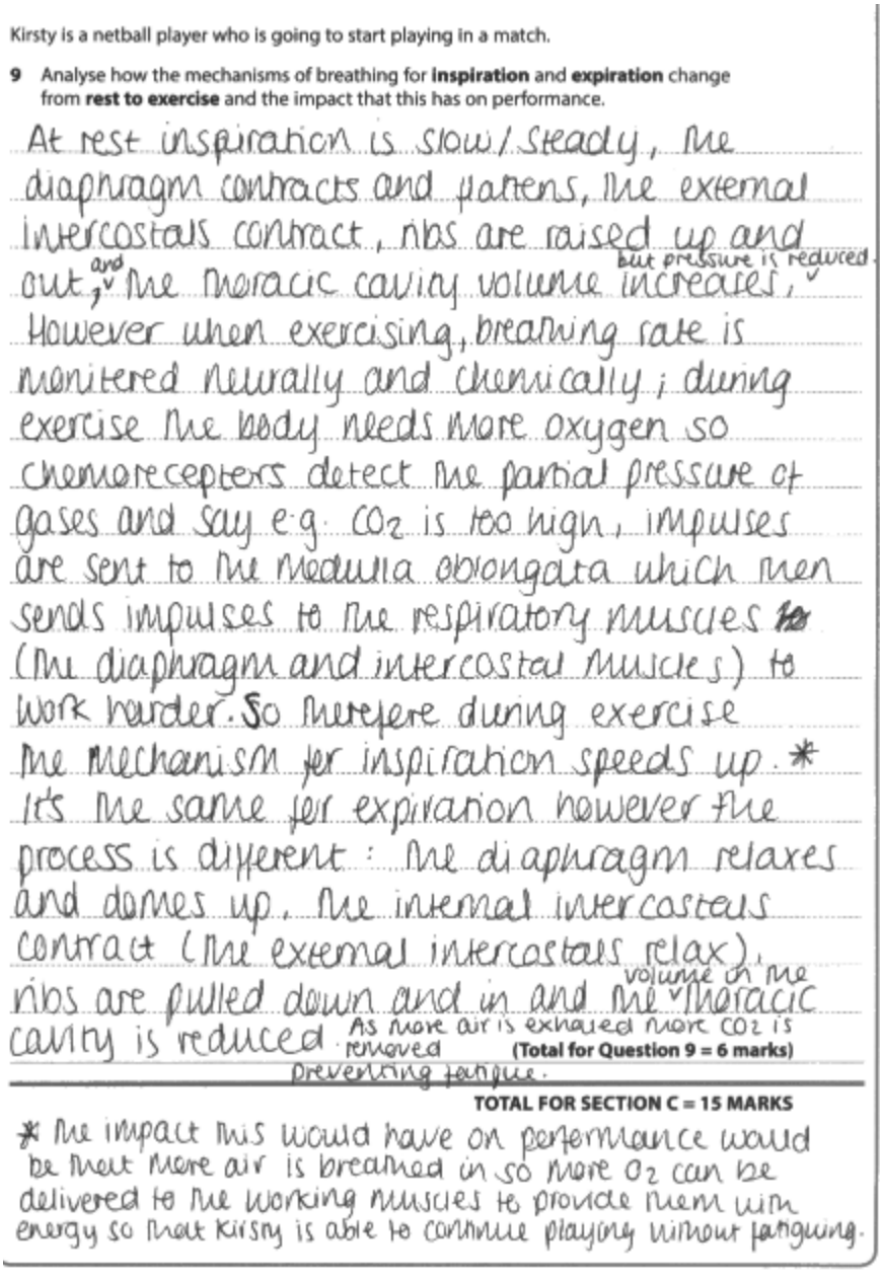
Level 1 responses tended to focus on this only happening at rest or provided content such as the role of the medulla and chemoreceptors. Links to performance were generalistic 'play at a higher intensity for longer'.

At level 3 candidates' responses provided accurate knowledge of the effects on performance of the changes in the mechanics of breathing

from rest to exercise, used technical terminology with clear development of the point and linked to netball performance.

Overall, this was a challenging question, and it was obvious from a number of responses that this knowledge was lacking, although a clear specification point (topic C2).
Some candidates also discussed the impacts on the cardiovascular system, when it was in the respiratory section and thus generated no credit.

This response was placed at Level 3 and given 6 marks. The answer clearly assesses a number of points from the indicative content, focusing on the changes with appropriate development in reference to the question.



Kirsty is a netball player who is going to start playing in a match.

9 Analyse how the mechanisms of breathing for **inspiration** and **expiration** change from **rest to exercise** and the impact that this has on performance.

At rest inspiration is slow / steady, the diaphragm contracts and flattens, the external intercostals contract, ribs are raised up and out, and the thoracic cavity volume increases, but pressure is reduced. However when exercising, breathing rate is monitored neurally and chemically; during exercise the body needs more oxygen so chemoreceptors detect the partial pressure of gases and say e.g. CO_2 is too high, impulses are sent to the medulla oblongata which then sends impulses to the respiratory muscles to (the diaphragm and intercostal muscles) to work harder. So therefore during exercise the mechanism for inspiration speeds up. * It's the same for expiration however the process is different: the diaphragm relaxes and domes up, the internal intercostals contract (the external intercostals relax), ribs are pulled down and in and the volume of the thoracic cavity is reduced. As more air is exhaled more CO_2 is removed preventing fatigue.

(Total for Question 9 = 6 marks)

TOTAL FOR SECTION C = 15 MARKS

* The impact this would have on performance would be that more air is breathed in so more O_2 can be delivered to the working muscles to provide them with energy so that Kirsty is able to continue playing without fatiguing.

This response was placed at Level 1 and given 2 marks. The answer provides several points on the mechanisms of breathing at rest, but no attempt to analyse the changes as required in the question**.**

Kirsty is a netball player who is going to start playing in a match.

9 Analyse how the mechanisms of breathing for **inspiration** and **expiration** change from **rest to exercise** and the impact that this has on performance.

Firstly, from inspiration at rest, this will result in the External intercostal muscles contracting, while the internal intercostal muscles relax, which therefore ~~[illegible]~~ increases the chest and Thoracic cavity, bringing it up and out, which moving that alongside the diaphragm contracting and flattening, will increase the lung volume + reduce the lung pressure to take air in at rest. However during exercise

Q10

The majority of candidates achieved 1 mark for preventing backflow. Significantly fewer identified the mark for identifying the backflow from the left ventricle to the left atrium. The same applied if they articulated the valve controls blood flow, the direction of blood flow was not as consistent.
Common errors were placing it on the right side of the heart.

This response gained 2 marks.

10 Describe the role of the bicuspid valve in the cardiac cycle.

This is located inbetween left atrium + ventricle, and allows blood flowing into the left ventricle, but prevents bachflow into the left atrium.

(Total for Question 10 = 2 marks)

This response gained 1 mark.

10 Describe the role of the bicuspid valve in the cardiac cycle.

The bicuspid valve controlls the amount of blood that enters the left atrium from the left ventricle.

Q11a

This was a recall question for identifying from the diagram structural parts responsible for nervous control of the cardiovascular system. Generally, candidates found this question challenging on this question with the vast majority of those accessing marks did so for the SAN. Common errors were stating right atrium rather than SAN, AVN rather than the bundle of his.

Note to centres that this would never be the case that the answer from a previous question (eg 11a) would be the following question topic area (eg 11b).

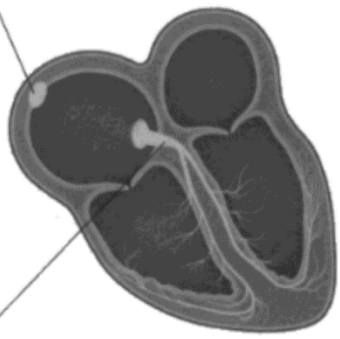
This response gained 2 marks.

Figure 4 is a diagram showing the nervous control of the cardiac cycle.

11 (a) Identify the structures labelled **A** and **B**.

(2)

A Sinoatrial node (SAN)



B Bundle of His.

Source: © Blamb/Shutterstock

Figure 4

Q11b

This question acted as a good differentiator, for describing the role of the AVN. It was clear from the spread of marks that some candidates found this question challenging and this area of knowledge of the specification was missing. Those who did display knowledge of the role generally accessed both marking points.

This response gained 2 marks.

(b) Describe the role of the atrioventricular node (AVN).

(2)

Slows down impulses from the SAN node allowing the ~~atrium~~ atria to contract first.

This response gained 0 marks.

(b) Describe the role of the atrioventricular node (AVN).

(2)

~~AVN is~~ atrioventricular node's role is to act as an electrical gatekeeper between the atria and ventricle

Q12

This was a recall question for stating the function of plasma, many candidates accessed a mark for transport of blood cells, oxygen, nutrients etc. Fewer accessed the second marking point which could have come from transport of waste, hormones or temperature control.

This response gained 2 marks.

12 State **two** functions of plasma.

1 Transport blood cells around the body to

2 Carry waste products (urea) for ~~the~~ removal.

This response gained 1 mark.

12 State **two** functions of plasma.

1 Transports blood around the body

2 Transports O_2 around the body

(Total for Question 12 = 2 marks)

Q13a

Q13a acted as a good differentiator, generally candidates achieved one mark for identifying that platlets were involved. Following this fewer candidates accessed the extension mark points that the platelets form a plug and reinforcement comes from fibrin and other blood cells to prevent further blood loss.

This response was awarded 3 marks.

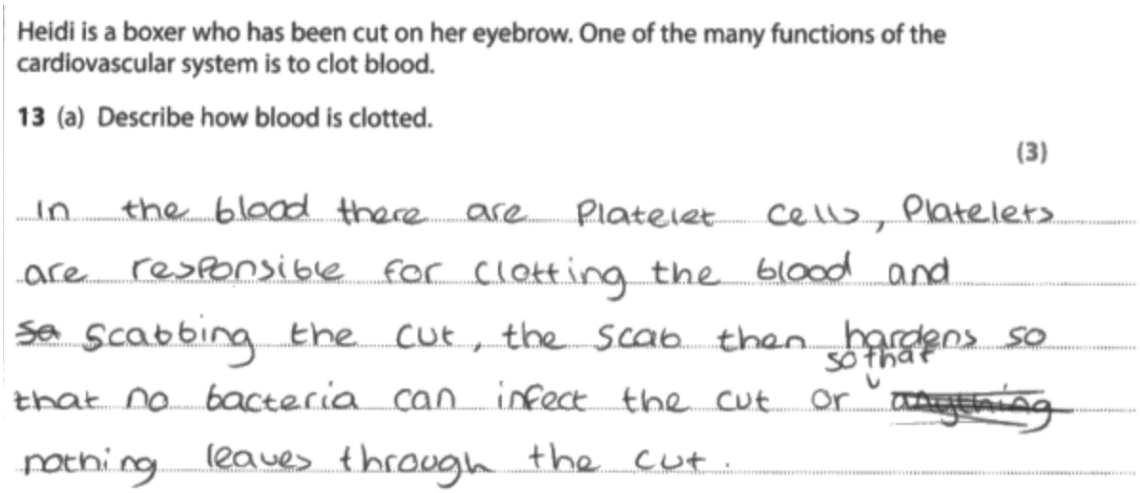
Heidi is a boxer who has been cut on her eyebrow. One of the many functions of the cardiovascular system is to clot blood.

13 (a) Describe how blood is clotted.

(3)

Blood clotting is done by platelets forming a plug in the open wound after this fibrin strands reinforce the plug making it like a net, then finally red and white blood cells get caught in the ~~blood~~ net reinforcing the plug preventing blood from leaving the body.

This response was awarded 1 mark.



Heidi is a boxer who has been cut on her eyebrow. One of the many functions of the cardiovascular system is to clot blood.

13 (a) Describe how blood is clotted.

(3)

In the blood there are Platelet cells, Platelets are responsible for clotting the blood and so scabbing the cut, the scab then hardens so that no bacteria can infect the cut or ~~anything~~ so that nothing leaves through the cut.

Q13b

This was the second extended response question of the paper and focused on the flow of blood from the left ventricle to the lungs and the impact that would have on boxing performance, the indicative content was written according to encompass this knowledge and application.

Like all of the extended response questions, the quality of candidate responses varied. Some candidates were clearly very knowledgeable about the flow of blood, but some candidates struggled to express this and missed a number of areas out.

Level 1 responses generally missed large parts of the pulmonary and systemic circulatory systems out and did not relate the delivery of oxygen and removal of waste to boxing performance. At level 3 candidates charted accurately the flow of blood through both systemic and pulmonary circulatory systems and and how that impacted on performance.

This response was placed at Level 3 and given 6 marks. The answer clearly assesses a number of points from the indicative content, focusing on the flow of blood from the left ventricle to the lungs, with effective use of technical terminology, appropriate development in reference to the effects on performance.

During the boxing match Heidi relies on her cardiovascular system to get her to the final rounds of the match.

(b) Analyse the flow of blood as it leaves the left ventricle and returns back to the lungs and how this helps Heidi last the whole boxing match.

(6)

When the blood leaves the left ventricle, it goes through the aortic valve then through the aorta where it is then sent around the body and to the working muscles. This means the muscles she is using during the boxing match take priority and get a constant supply of oxygenated blood. Once the blood then removes CO2 from the working muscle and starts to take it back to the heart. The removal of waste product help Heidi because she will fatigue less easily. When it is sent to the to the, it then goes through the ~~anterior~~ vena cavea and into the right atrium. From this, it then goes through the bicuspid valve to the right ventricle. From here it then goes up through the pulmonary ~~artery~~ valve and goes to the pulmonary artery which takes it the blood from the heart to the lungs to get ~~deoxygenated~~ ~~then into lungs~~ and oxygenated. The blood goes through the pulmonary vein back to the heart. This system repeated itself over and over for the however long she needs it for. This will help Heidi her as strong and powerful for as long as she can

This response was placed at Level 1 and given 2 marks. The answer provides some correct information from the indicative content, but the flow of blood is in the incorrect order, there is an attempt to link to performance by her defending herself.

(b) Analyse the flow of blood as it leaves the left ventricle and returns back to the lungs and how this helps Heidi last the whole boxing match.

(6)

Deoxygenated blood is pumped into the heart via the vena cava where it is then taken away from the ~~heart~~ lungs via the pulmonary artery where it becomes oxygenated it will then pass through the pulmonary vein ~~which~~ at a high pressure out of the aorta and to the muscles and cells ~~to~~ ~~be~~ which warms ~~the muscles and~~ Heidi's muscles ~~and allows more movement~~ meaning there is more movement which is beneficial, ~~for~~ for example if Heidi tries to punch her opponent this process allows her to punch them with more power. ~~and~~ This process also means she can withstand fatigue for a longer period ~~of~~ of time therefore can defend herself from her opponents punches. As a result of boxing during the match Heidi may experience cardiac hypertrophy ~~where~~ as a long term response where her heart increases in muscle and her veins and capillaries become stronger meaning they can pump blood at a higher rate which allows heidi to work at a higher intensity for a longer duration

(Total for Question 13 = 9 marks)

Q14

This was a recall question for identifying recovery time for each of the energy systems, marks were awarded for anything that fell within a range. The majority of candidates performed well and achieved at least 2 marks, with many accessing all marks. Common errors were around incorrect timings.

This response was awarded 3 marks.

14 Complete **Table 4** by giving the recovery time for each energy system (**A–C**).

Energy system	Recovery time
ATP-PC	A - 1 - 3 minutes
Lactate	B - 3 minutes - 1 hour
Aerobic	C - 24 hours

Table 4

Q15

This question proved to be a good differentiator, evident through the spread of marks. It was clear that those candidates who understood how the ATP-PC system resynthesises ATP, scored heavily. However, some candidates found this question difficult to access any of available marks, due to lack of knowledge and understanding. Common errors were discussing other energy systems.

This response gained 4 marks

15 Describe how the ATP-PC system resynthesises ATP.

Phosphocreatine is broken down by the enzyme creating Creatine Kinese. Leaving a single phosphate energy and creatine. The phosphate and energy go into a Coupled reaction with ATP to resynthesise ATP. Leaving a single phosphate per one mole of phosphocreatine. This takes place in a Sarcoplasm. The work to rest ratio is 1:10-12. Full recovery takes 2-3 minutes and this creates 1 ATP.

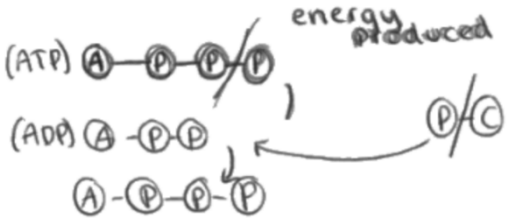
(Total for Question 15 = 4 marks)

This response gained 2 marks

15 Describe how the ATP-PC system resynthesises ATP.

ATP is adenine tri-phosphate and when enzymes break this down into ADP (adenine di-phosphate) it loses a molecule of phosephate however the ATP-PC system resynthesises ATP by breaking down ~~a molecule called~~ phosphate creatine (PC) and the phosphate molecule produced from this gets put with the ADP which resynthesises it back to ATP.

(Total for Question 15 = 4 marks)



Q16

The final question of this section required the candidates to analyse the role of the energy systems in football performance.

Like all of the extended response questions, the quality of candidate responses varied. Some candidates were clearly very knowledgeable about the energy systems in relation to intensity and duration and could articulate where each system contributes to football performance. Other candidates were unable to address the question fully by writing everything they knew about the energy system in general rather than answering the specific question.

Level 1 responses came from those candidates who identified around time or intensity for each system and not both, with limited or accurate links to performance. Level 3 responses were those who assessed all energy systems in terms of intensity and time and linked this directly into performance. They articulated using technical terminology

This response was placed at Level 3 and given 6 marks. The answer analyses the contributions of each of the energy systems and develops a number of points from the indicative content. Clear relation to performance is evident.

Juan is a footballer.

16 Assess how each of the **three** energy systems contribute to Juan's football performance.

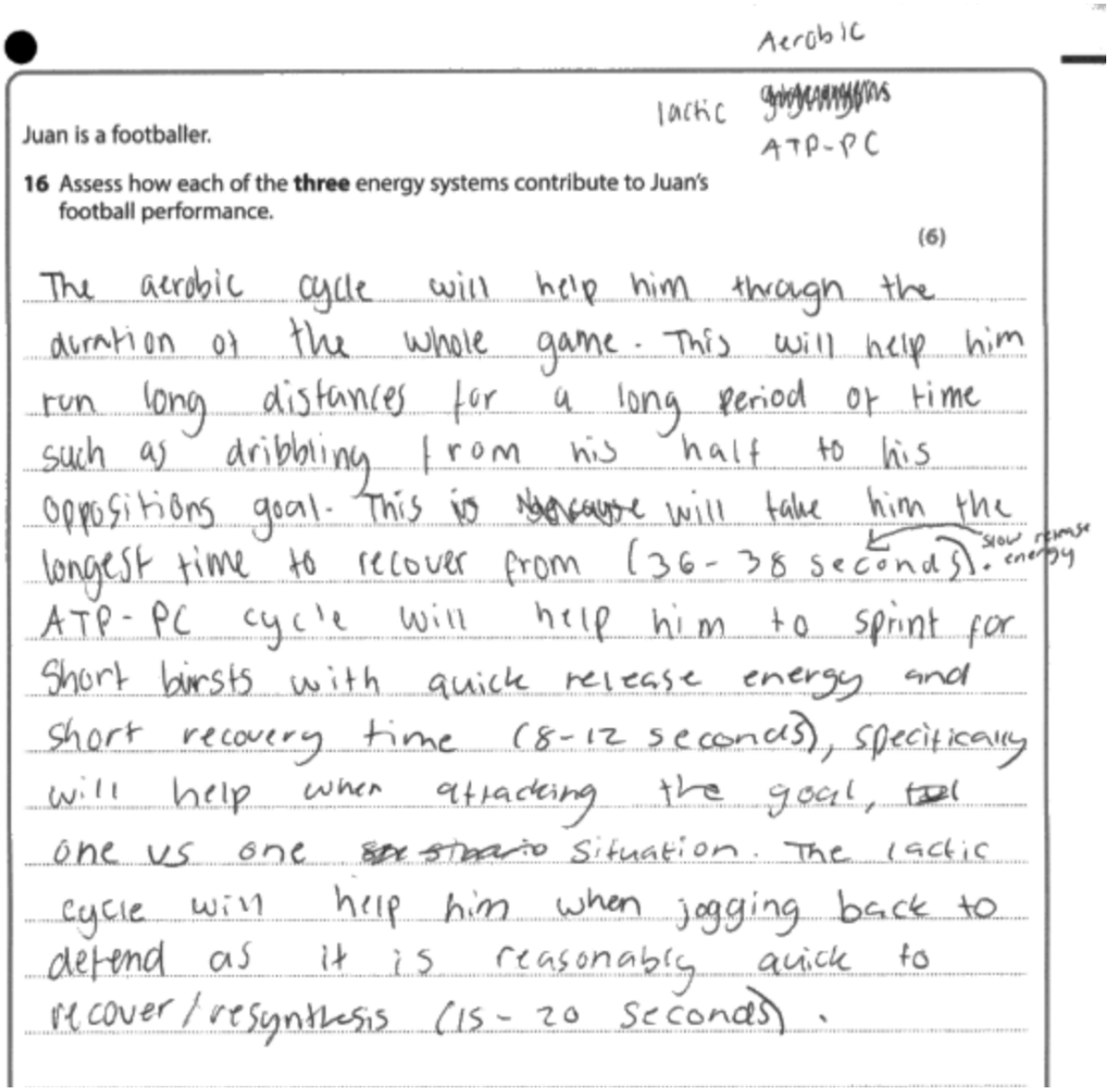
(6)

ATP-PC is used for short burst of energy and ~~helps~~ ~~over~~ it is used on in very high intensity exercises and last to about 3 seconds Juan will need this energy system when going to strike the ~~flood~~ football as he needs to ~~strike the ball~~ a short burst of energy and ~~the~~ ~~strikit~~ striking the ball will only take 2-3 seconds to happen. it also works anaerobically

The lactate system is used for ~~a~~ high/moderate intensity and is able to about 3 minutes~~##~~ Juan will need this as he might need to do a light run to get ~~the~~ a loss ball. as he will be ~~it~~ it also works anaerobically. using less oxygen when sprinting.

The aerobic energy system is used for low intensity exercises it is able to last from ~~3~~ 3min to multiple hours and it uses oxygen to work Juan will need this to last the full ~~#~~ 90 minutes of the match

This response was placed at Level 1 and given 2 marks. The answer generates credit through the attempt to link the system to performance, but this is not consistent and always accurate. Time and intensity is referenced to recover and not work period and therefore irrelevant in the context of this question.



Aerobic

lactic

ATP-PC

Juan is a footballer.

16 Assess how each of the **three** energy systems contribute to Juan's football performance.

(6)

The aerobic cycle will help him thrugh the duration of the whole game. This will help him run long distances for a long period of time such as dribbling from his half to his oppositions goal. This will take him the longest time to recover from (36-38 seconds). slow release energy

ATP-PC cycle will help him to sprint for short bursts with quick release energy and short recovery time (8-12 seconds), specifically will help when attacking the goal, one vs one situation. The lactic cycle will help him when jogging back to defend as it is reasonably quick to recover/resynthesis (15-20 seconds).

Q17

The final question in the paper is a synoptic analysis. I urge centres to read the guidance under AO5 (page 20) of the specification to see the combinations between body systems. This question will always be a maximum of two systems. Candidates should look to synthesise their writing and make connections between the systems where possible demonstrating the inter-relationship.

Like all of the extended response questions, the quality of candidate responses varied. Some candidates were clearly very knowledgeable about how the cardiovascular and energy system work together. Some candidates were unable to address the question fully.

Low level responses demonstrated some knowledge and understanding of the indicative content and often lacked balance or coverage. Common errors were bringing in skeletal or respiratory responses and adaptations, so irrelevant in the context of this question.

High level responses displayed synoptic coverage from both areas as well as making link to how these systems work collectively. High-level responses displayed coverage from both areas as well as clearly relating this to the movement taking place.

Level 1 responses tended to focus on isolated elements that make general assertions and did not reference impact. Level 4 responses provided accurate knowledge of both the cardiovascular and energy system adaptations and how they work together. Like any levels of response-based question, it is not 1 point equals 1 mark, the indicative content is extensive for candidates to demonstrate a breadth of knowledge and generate credit.

This response below was placed at Level 4 and given 8 marks. The answer clearly analyses how the systems work together. Each system's adaptations are visited and application to the warm up and interrelationships are developed throughout.

Sunita is a rugby player. She has completed a pre-season training plan resulting in long-term adaptations to her cardiovascular and energy systems.

17 Analyse how the adaptations to Sunita's cardiovascular and energy systems will impact on her rugby performance.

(8)

Adaptions to Sunitas cardiovascular system will help to improve her performance for example cardiac hypertrophy is the increased strength and size of the heart this adaption means more oxygen can be sent to the working muscles as well as an increase in amount of waste products being removed this benefits the energy system as well since this means Sunitas aerobic system will be able to have a greater supply of oxygen and when the pyruvate is made into lactic acid this can be removed quickly. Another adaption this time of the energy system is an increased resistance to lactic acid this means the muscles can work for longer with the presence of lactic acid especially at later periods of the game. meaning she can walk at higher intensities throughout the game without fatiguing causing her to be faster and stronger in her performances. Another adaption is an increased number of mitochondria this means that more energy can be produced for the aerobic system as for the aerobic system the mitochondria is the location used for the production of energy therefore more reactions can happen so Sunita will have more energy so she can cover more distance in a match.

Another adaption of the cardiovascular system is an increased cardiac output.

A final adaption which will impact Sunita's performance would be an increase store of ATP used for the ATP-PC system meaning she can use the system for long such as in a sprint when carrying the ball for a try.

This response below was placed at Level 2 and given 4 marks. The answer identifies isolated elements of knowledge and understanding, cardiovascular and energy system adaptations, however, the information is a little vague and application to performance is weak.

Sunita is a rugby player. She has completed a pre-season training plan resulting in long-term adaptations to her cardiovascular and energy systems.

17 Analyse how the adaptations to Sunita's cardiovascular and energy systems will impact on her rugby performance.

(8)

Adaptations to Sunita's cardiovascular system will impact her performance because it will increase her L cardiac hypotrophy meaning that heart will become larger resulting in a more abundant amount of oxygenated blood to be transferred to her working muscle muscles allow for a long high intensity performance.

Another adaptation is improved resistance to lactic acid build up. As a result she will b lessen the effects of lactic acid and not become very fatigued in a short amount of time due to this her recovery time of her lactate system will decrease.

She can lessen the amount of time that it takes it her aerobic system to recover resulting in a faster recovery rate and can perform again

Summary

Based on their performance on this paper, candidates should:

- Use appropriate technical language throughout their responses,
- Tailor their response based on the command word in the question, e.g. for an explain question there will always be marks available for expansion points and relevance to the scenario.
- Be clear about terminology used in the specification as these words will be repeated in the exam paper, e.g. short-term responses (immediate, due to the exercise/sport), adaptations (long term).
- Only address the correct body system within this section, e.g.in Section A 'The Skeletal System' credit will only be awarded for responses from the specification of the skeletal system. No marks will be available for reference to any other body system.
- I urge Centre's to read the guidance under AO5 (page 20) of the specification to see the combinations between body systems.
- Use the question scenario to demonstrate their ability to apply their knowledge and not write general impacts, but relate this to performance.
- Check their paper carefully for any missed questions and attempt and read everything.
- Please click here for the specification and SAMS.

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